

246057

UNITED STATES ATOMIC ENERGY COMMISSION

SOME NEW RADIOACTIVE ISOTOPES

by

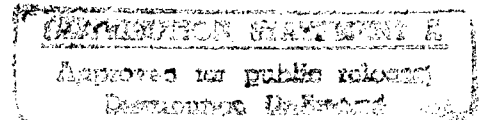
Geoffrey Wilkinson
Harry G. Hicks

University of California
Radiation Laboratory

This document is reproduced as a project report and is without editorial preparation. The manuscript has been submitted to The Physical Review for possible publication.

Date of Manuscript: August 6, 1948
Date Declassified: September 21, 1948

Its issuance does not constitute authority for declassification of classified copies of the same or similar content and title and by the same authors.



DTIC QUALITY INSPECTED 4

Technical Information Branch, Oak Ridge, Tennessee
AEC, Oak Ridge, Tenn., 2-9-49--850-A3562

Printed in U.S.A.
PRICE 5 CENTS

#14

FILE COPY
NAVY RESEARCH SECTION
SCIENCE DIVISION
LIBRARY OF CONGRESS
TO BE RETURNED

19970205 125

SOME NEW RADIOACTIVE ISOTOPES

By Geoffrey Wilkinson and Harry G. Hicks

In order to allow quantitative interpretation of the reactions of high energy particles from the 184-inch cyclotron with tantalum and heavier elements, a systematic survey is being made of radioactive isotopes of the rare earth elements and hafnium, tantalum, tungsten and rhenium. Bombardments of various elements are being made using 38-Mev and 20-Mev helium ions, 19-Mev deuterons, and 10-Mev protons from the 60-inch Crocker Laboratory cyclotron. Chemical separation of the rare earth elements is made by ion-exchange resin columns. The accompanying table summarizes present data; energies of radiations are determined from absorption measurements; positrons are observed using a "magnetic counter"; mass allocations are made on the basis of measured cross sections.

Detailed accounts of experimental techniques and of the isotopes will be published.

The allocation of the previously reported β active isotopes of lutecium with half-lives of 3.75h and 6.8d, to masses 176 and 177 respectively, has been confirmed by measurement of the d,p cross sections for 19-Mev deuterons on lutecium.

Table 1.

Isotope	Class	Type of radiation	Half-life	Energy of particles	Radiation in Mev γ -Rays	Produced by
Tb ¹⁵²	D	K	4.5h		K,x-rays	Eu- α -3n
Tb ¹⁵³	D	K,e ⁻	5.1d	0.15, 0.4	L,K,x-rays	Eu- α -2n
Tb ¹⁵⁴	D	β^+ ,K,e ⁻ , γ	17.2h	β^+ 2.6 e ⁻ 0.22, ~1	L,K,x-rays 1.4	Eu- α -n Eu- α -3n
Tb ¹⁵⁵	D	K,e ⁻	~1y	0.1	L,K,x-rays	Eu- α -2n
Ho ¹⁶⁰	D	K?	~20m		x-rays	Tb- α -3n
Ho ¹⁶¹	B	K,e ⁻ , γ	4.5h	0.3	L,K,x-rays 1.1	Tb- α -2n Dy-p-n
Ho ¹⁶²	B	K,e ⁻ , γ	65d	0.16,0.6	L,K,x-rays	Tb- α -n Dy-d-n, 2n, 3n
Ho ¹⁶⁴	D	β^-	35m	0.7		Dy-p-n
Tm ¹⁶⁶	B	β^+ ,K,e ⁻ , γ	7.7h	β^+ 2.1 e ⁻ 0.24, ~1	L,K,x-rays ~1.5	Ho- α -3n
Tm ¹⁶⁷	B	K,e ⁻ , γ	9d	0.21	L,K,x-rays 0.22, 0.95	Ho- α -2n Ta-d-5z-16a
Tm ¹⁶⁸	B	K?e ⁻	~150d			Ho- α -3n

Table 1. (continued)

Isotope	Class	Type of radiation	Half-life	Energy of particles	Radiation in Mev γ -Rays	Produced by
Lu ¹⁷⁰	B	β^+ , K, e^- , γ	2.15d	β^+ 1.7 e^- 0.1	L, K, x-rays 1.5	Tm- α -3n Yb-d-2n, 3n Ta-d-3z-13a
Lu ¹⁷¹	B	K, e^- , γ	9d	0.17, 0.7	L, K, x-rays	Tm- α -2n Ta-d-3z-12a Yb-d-n, 2n, 3n
Lu ¹⁷²	B	K, e^- , γ	>100d			Tm- α -n Yb- α -n, 2n, 3n
Ta ¹⁷⁶	B	K, e^- , γ	8.0	0.12, 0.18, 1.2	L, K, x-rays 1.7	Lu- α -3n Ta-d-z-7a
Ta ¹⁷⁷	B	K, e^-	2.66d	0.1	L, K, x-rays	Lu- α -2n Ta-d-z-6a Hf-d-n, 2n, 3n
Ta ¹⁷⁹	B	K, e^- or β^-	16d	1.1		Lu- α -n Hf-d-n, 2n, 3n
Re ¹⁸²	B	K, e^- , γ	64h	0.11, 0.27 0.6	L, K, x-rays 0.22, 1.5	Ta- α -3n W-p-n
Re ¹⁸³ or 4 C	C	K, e^- , γ	\sim 80d	0.1	L, K, x-rays 1.0	Ta- α -2n W-p-n
Re ¹⁸⁴ or 3 C	C	K, γ	13h		K, x-rays 1.6	Ta- α -n W-p-n

END OF DOCUMENT